PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	To what extent do education and physical work load factors explain occupational differences in disability retirement due to knee OA? A nationwide register-based study in Finland.
AUTHORS	Kontio, Tea; Viikari-Juntura, Eira; Solovieva, Svetlana

VERSION 1 – REVIEW

REVIEWER	Martin Englund Lund University, Sweden
REVIEW RETURNED	22-Apr-2018

GENERAL COMMENTS	This is a well conducted observational study using Finnish register data on the topic of occupations, physical work load and risk of disability pension due to knee OA. I've seen this manuscript before and my input then has been adressed. In general the manuscript reads very well, methods, statistics and interpretation of results are adequate. Some comments: Abstract: The current conclusion “The risk of disability retirement among manual workers could be markedly reduced if the physical work load factors were at the level of those among professionals.”is a slightly too strongly worded based on these observational data. Please rephrase as appropriate, e.g.: “Our observational data suggest that the risk of disability retirement among manual workers could be markedly reduced if the physical work load factors were at the level of those among professionals"

REVIEWER	André Bieleman Saxion University of Applied Sciences, Enschede, the Netherlands
REVIEW RETURNED	19-Sep-2018

GENERAL COMMENTS	Review of bmjopen-2018-023057 The manuscript describes an interesting and relevant study on explanatory factors for disability retirement due to knee OA. A major strenght is undoubtedly the large population and the 9 year follow-up. The methods of analysis are rather complex and I believe they need more explanation for a wider reader audience (both 'technical' and interpretation). Abstract: The conclusion doesn't match the conclusion in the manuscript (+ see comment further on). Introduction: The authors summarize relevant literature to support their rationale and the aims of the study are clear. Materials and methods:

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	Please present some information on the scales that the physical work load factors were measured on + how was Heavy Physical Work defined and operationalized? Statistical analysis: Please briefly explain the use of a Poisson distribution; I believe this is adequate for events that happen quite rarely, is that correct? What is the meaning of accounting for competing risks; can these results be seen somewhere in the results (compared to other causes retirement and death)? Results: 'The physical work load factors completely mediated the effect .....': what does this mean exactly and how can it be seen in the table? The effect of what, occupation? And what is the mediating 'mechanism', how are the effects influenced? Does it mean that in model 3 these HR's are no longer statistically significant? Please consider describing one example with exact numbers from the table to help the reader understand the table and the text. Table 3: what does 'mutually' mean? + please add 'Hazard Ratio's' to the legend. Discussion: page 11: reference 31 is from 1993, is there perhaps a more recent source, considering changes in working conditions, demographics, etc. since then? And (next sentence) what result is your 50% disability retirement due to knee OA based on? The excess risk for female teaching professionals seems a surprising result which I cannot match to table 5 (negative value for HPW; 66.7% explained by sitting?). 'Excess risk ... could be eliminated if the physical work load factors would be at the level of those professionals': are you suggesting preventive measures? How could this be achieved? This doesn't seem to be the focus of the manuscript, so it stays a bit of a peculiar theoretical statement. The discussion on the increased risks of disability retirement after controlling for education and physical work load is relevant and important. Could participation in sports also be a factor that was not captured? Besides this, I believe the authors should discuss the meaning of the confounding by education and the mediating role of physical work load more clearly: what factors are mediated exactly by physical work load and how? 'Translating' the statistical results into interpreting the mechanisms by which they work will help the reader.

VERSION 1 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 1
Reviewer Name: Martin Englund

Institution and Country: Lund University, Sweden

Please state any competing interests or state 'None declared': None declared

This is a well conducted observational study using Finnish register data on the topic of occupations, physical work load and risk of disability pension due to knee OA. I've seen this manuscript before and

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my input then has been adressed. In general the manuscript reads very well, methods, statistics and interpretation of results are adequate.
Some comments:
Abstract:
The current conclusion “The risk of disability retirement among manual workers could be markedly reduced if the physical work load factors were at the level of those among professionals.”is a slightly too strongly worded based on these observational data.
Please rephrase as appropriate, e.g.: “Our observational data suggest that the risk of disability retirement among manual workers could be markedly reduced if the physical work load factors were at the level of those among professionals"

Authors’ response: We have revised the abstract: “Our observational study suggests that the risk of disability retirement among manual workers is strongly attributed to the physically heavy work.”

Reviewer: 2
Reviewer Name: André Bieleman, Institution and Country: Saxion University of Applied Sciences, Enschede, the Netherlands

Please state any competing interests or state ‘None declared’: none declared

A major strength is undoubtedly the large population and the 9 year follow-up. The methods of analysis are rather complex and I believe they need more explanation for a wider reader audience (both 'technical' and interpretation).

Abstract:
The conclusion doesn't match the conclusion in the manuscript (+ see comment further on).

Authors’ response: We have now streamlined the last sentence of the Conclusions in the Discussion with that in the Abstract.

Introduction:
The authors summarize relevant literature to support their rationale and the aims of the study are clear.

Materials and methods:
Please present some information on the scales that the physical work load factors were measured on + how was Heavy Physical Work defined and operationalized?

Authors’ response: We have given definitions for the physical exposures and indicated the measurement scale of the job exposure matrix (exposed, non-exposed) in the Methods, under “Physical load factors”, on page 6.

Statistical analysis:
Please briefly explain the use of a Poisson distribution; I believe this is adequate for events that happen quite rarely, is that correct?

Authors’ response: The incidence of specific disease is assumed to be an uncommon event in populations, therefore it is usually modelled using a Poisson distribution. Calculation of the confidence interval for the incidence rate of a disease is typically done by computing the confidence interval from a sample of observations drawn at random from a Poisson distribution (Rothman KJ, Greenland S. Modern Epidemiology (2nd edition). Philadelphia: Lippincott-Raven 1998).

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What is the meaning of accounting for competing risks; can these results be seen somewhere in the results (compared to other causes retirement and death)?

Authors' response: A competing risk is an event whose occurrence precludes the occurrence of the primary event of interest. Our primary event of interest was disability retirement due to knee OA. Subjects who retired due to other disease, retired due to old-age or died are no longer at risk of disability retirement due to knee OA, therefore, retirement due to other reason than knee OA and death are competing risks. In the presence of competing risks, Cox proportional hazards regression produces biased estimates of HRs. Accounting for competing risks means to control for bias in estimates induced by the presence of competing risks.

Results:
'The physical work load factors completely mediated the effect .....': what does this mean exactly and how can it be seen in the table? The effect of what, occupation? And what is the mediating 'mechanism', how are the effects influenced? Does it mean that in model 3 these HR's are no longer statistically significant? Please consider describing one example with exact numbers from the table to help the reader understand the table and the text.

Authors' response: We have written an explanation of this into the Methods, Under Statistical Analysis, on page 7, next to last paragraph: "If the risk of disability retirement for a certain occupation was statistically significant in model 2 and became non-significant in model 3, then the physical load factors completely mediated the association."

Table 3: what does 'mutually' mean? + please add 'Hazard Ratio's' to the legend.

Authors' response: Mutual adjustments means that adjustment is made for each variable in the table. Hazard ratio has been added.

Discussion:
page 11: reference 31 is from 1993, is there perhaps a more recent source, considering changes in working conditions, demographics, etc. since then?

Authors' response: We added two more recent references:

Vignon E, Valat JP, Rossignol M, Avouac B, Rozenberg S, Thoumie P, Avouac J, Nordin M, Hilliquin P. Osteoarthritis of the knee and hip and activity: a systematic international review and synthesis (OASIS). Joint Bone Spine 2006; 73(4):442-55.

Coggon D, Croft P, Kellingray S, Barrett D, McLaren M, Cooper C. Occupational physical activities and osteoarthritis of the knee. Arthritis Rheum 2000; 43(7):1443-9.

And (next sentence) what result is your 50% disability retirement due to knee OA based on?

Authors' response: This result is generalized from table 4: In manual occupations 6/9 in men and 7/9 in women PRE based on model 3 had values higher than 50%.

The excess risk for female teaching professionals seems a surprising result which I cannot match to table 5 (negative value for HPW; 66.7% explained by sitting?). 'Excess risk ... could be eliminated if the physical work load factors would be at the level of those professionals': are you suggesting

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preventive measures? How could this be achieved? This doesn't seem to be the focus of the manuscript, so it stays a bit of a peculiar theoretical statement.

Authors' response: The teaching professionals have a higher level of education as compared with the professionals, but the incidence of disability retirement due to knee OA among teachers is higher than among the professionals. Inclusion of education into the age-adjusted model resulted in an increase of HR for teaching professionals from 1.51 to 1.72, suggesting a negative confounding (Table 4).

The prevalence of heavy physical work among teachers is lower than among professionals, therefore the proportion explained (PRE) for heavy physical work became negative (i.e., their disability retirement is not explained by being exposed to heavy physical work as among the other occupations).
The prevalence of sitting among female professionals who retired due to knee OA was lower than among those who did not retire due to knee OA. In contrast, the prevalence of sitting among female teaching professionals who retired due to knee OA was higher than among those who did not retire due to knee OA. This resulted in high value for PRE. However, a high proportion of disability retirement due to knee OA among teachers attributed to the sitting may also mean that the excess risk of disability retirement is attributed to another unmeasured exposure/factor (e.g obesity) which is strongly associated with sitting.

We have revised the conclusion: "Our observational study suggests that the risk of disability retirement among manual workers is strongly attributed to the physically heavy work. Prevention measures should focus on the reduction of physically heavy tasks, kneeling or squatting activities and lifting and carrying of loads. More intervention studies on the effectiveness of aids and working methods for reducing knee straining activities are needed."

The discussion on the increased risks of disability retirement after controlling for education and physical work load is relevant and important. Could participation in sports also be a factor that was not captured?

Authors' response: We agree that participation in sports is an important lifestyle factor about which we did not have information.

Besides this, I believe the authors should discuss the meaning of the confounding by education and the mediating role of physical work load more clearly: what factors are mediated exactly by physical work load and how? 'Translating' the statistical results into interpreting the mechanisms by which they work will help the reader.

Authors' response: The study assesses the research question, to what extent excess risk of disability retirement in certain occupations could be attributed to physical work load factors. Accordingly, we estimated the mediating effect of physical load factors in this association.

VERSION 2 – REVIEW

REVIEWER	André Bieleman Saxion Universities of Applied Science, Enschede, the Netherlands
REVIEW RETURNED	22-Oct-2018

GENERAL COMMENTS	The authors seriously and adequately addressed the reviewers comments, I am satisfied with the changes they made.

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